STIRLING BRIDGE
- AN ELEGANT SOLUTION -

ENGINEERS AUSTRALIA

mainroads WESTERN AUSTRALIA

THE GOVERNMENT OF WESTERN AUSTRALIA

A NEW CROSSING FOR THE SWAN RIVER

The Stirling Bridge was constructed to meet the traffic requirements generated by the continuing development of heavy industry in the Kwinana area and to provide a bypass to the City of Fremantle.

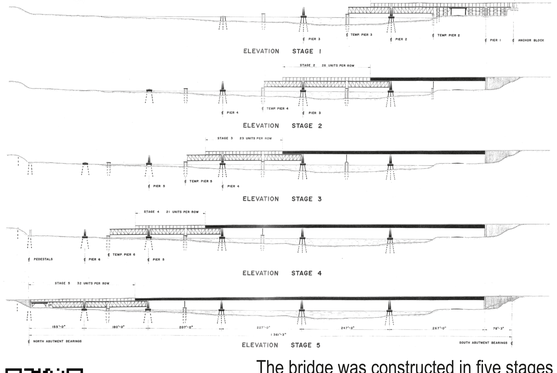
The crossing was planned to be achieved in two stages. The first bridge was completed in 1974 and the second, to be built when required, will duplicate the existing structure on the upstream side, adding another three lanes and giving a combined width of 35 metres.

AN AESTHETIC DESIGN

Main Roads WA appointed Maunsell and Partners to design and supervise the construction of the bridge. The accepted solution was a seven span, twin post-tensioned segmental spine concrete structure with an overall length of 415 metres.

Maunsell took into account the beauty of the site and they succeeded in designing a bridge which sits gracefully in its environment displaying the elegant lines of its thoughtful design. The reduction in depth of the superstructure from a maximum of 3.4 metres at the south abutment to a minimum of 1.8 metres at the north abutment complements the reduction in span lengths and soffit clearance height from south to north, producing a pleasing appearance, particularly when viewed in elevation.

The architectural shape of the pier columns was designed to provide a changing contrast from light to shade as the sun moves across the sky.



The bridge was constructed in five stages working from south to north

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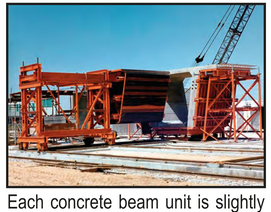
The crane barge used to drive piles and transport the steel falsework

Column formwork ready to pour the concrete



Each concrete beam unit is slightly different. Adjustable forms were used to ensure all 292 units were accurately cast

Gantry crane placing a concrete beam unit onto falsework

CONSTRUCTING THE BRIDGE

Tenders were called for the construction of the bridge in early 1972. The lowest tender of $2,560,000, submitted by Perth firm J O Clough and Son Pty Ltd, was accepted on 12 June 1972, with a required contact completion date of 14 July 1974.

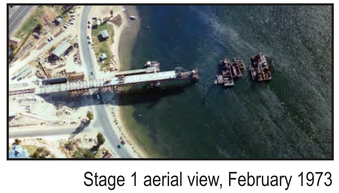
The 74 permanent tubular steel pier support piles were driven to depths up to 51 metres using a crane barge equipped with diesel pile driving hammers. Temporary piles were also driven to support the formwork for the permanent concrete pile caps and the three half-span steel falsework trusses. Concrete was ferried from a temporary jetty on the south shore in a kibble which was then lifted by the crane and placed in the pile caps and columns.

The superstructure of a post tensioned concrete bridge consists of precast concrete units, in this case 2.97 m long, erected and accurately aligned and levelled on a supporting structure known as falsework. The 75 mm joints between individual units were then filled with a high quality concrete and high tensile steel cables drawn through preformed ducts within the units. After the joint concrete had reached sufficient strength a jacking force is then applied to the cables at the ends of a stage of units which causes them to become self supporting and the falsework could then be removed and used in a later stage.

There were five stages of construction, each consisting of an upstream row and a downstream row. The upstream row was constructed first, and after completion, the falsework lowered and moved sideways to support the units for the downstream row. The respective stages for each row were joined at the quarter points of the spans by connecting the rear ends of the cables for the row under construction with the front ends of the previously completed row.

The 292 individual beam units which made up the superstructure were precast at Clough's concrete casting yard at Kewdale, then transported 24 kms by low loader to the site. A purpose built gantry crane unloaded the units onto a rail mounted transporter, which conveyed them over the previously completed deck to the placing gantry which lowered them on to the falsework.

Stage 1 construction, showing completed upstream row and temporary piers supporting the falsework truss and placing gantry. The downstream row is nearing completion.



Stage 1 aerial view, February 1973

View of completed bridge from south abutment, May 1974

BASIC DATA

Length: 415m
Width: 16.4m
Min. clearance: 9m
Max. pile depth: 51m

Materials used:
- 7,925 cubic metres of concrete
- 1,110 tonnes of reinforcing steel
- 285 tonnes of high-tensile steel cable
- 74 tubular steel 0.73m dia pier piles
- 21 tubular steel 0.47m dia abutment piles

OFFICIAL OPENING

The bridge was completed three months ahead of schedule and was officially opened to traffic by the Premier of Western Australia Hon Sir Charles Court, OBE., MLA on 17 May 1974. At the time of its construction it was the longest bridge in Western Australia.

Sir Charles Court officially opening Stirling Bridge, assisted by Mr Don Aitken

EMINENT PERSONS

Court

Aitken

Clough

Fernie

Eminent Western Australians associated with the planning, design and construction of the bridge included Sir Charles Court, Premier of Western Australia, Mr Don Aitken, Commissioner of Main Roads WA, Mr Gilbert Marsh, Bridge Engineer Main Roads WA, Mr Geoffrey Fernie, Maunsell and Partners Bridge Design and Resident Engineer, Mr Harold Clough, Managing Director J. O. Clough and Son Pty. Ltd., Mr Don Young, Clough Project Director and Mr Peter Knight, Clough Site Construction Manager.

An Engineering Heritage Marker was awarded to Main Roads WA on xxx, 2014.

ENGINEERING HERITAGE MARKER

Photographs courtesy of Clough and Son Pty Ltd and State Library of WA